

ECOBEHAVIORAL CHARACTERISTICS OF A PEDIATRIC BURN INJURY UNIT

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Behavioral observations were conducted on 40 children admitted consecutively to an inpatient pediatric burn care unit (PBCU) over a 6-month period. Children's responses to the PBCU environment as well as adult responses to patients were assessed. Data indicated that children most frequently (a) were oriented and alert, (b) emitted vocalizations or verbalizations, (c) were environmentally engaged, (d) and demonstrated positive or neutral affective responding. Adult-child interactions occurred during the majority of observations. Age was found to be significantly related to the type of distress response exhibited. Positive responses indicative of patient well-being were found to be associated with environmental engagement and the presence of other patients. In general, little evidence emerged to support the notion of a PBCU response pattern which resembles that observed in pediatric intensive care units (i.e., ICU syndrome). The use of observational methods for studying the behavioral adaptation of children in medical settings and the implications of the data for the design of interventions on PBCUs are discussed.

DESCRIPTORS: assessment, behavioral pediatrics, children, ecobehavioral characteristics, pediatric burns

Children are a high-risk population for burn injuries (Gordon, 1979). In the United States, approximately one million children sustain burn injuries each year (Dimick, 1977). In many cases, these injuries result in hospitalization, separation from families and peers, repeated painful medical procedures, and disfigurement (Clarke, 1980; Tarnowski, McGrath, Calhoun, & Drabman, 1987; Tarnowski & Rasnake, in press; Tarnowski, Rasnake, & Drabman, 1987). Despite the prevalence and devastating medical and psychological consequences of pediatric burn injuries, little behavioral research has been conducted with this population, and assessment studies have been most notably lacking (Klein & Charlton, 1980; see Tarnowski et al., 1987, for an extensive review of the behavioral literature regarding pediatric burn injuries).

In several respects, the experiences of children on pediatric burn care units (PBCUs) are similar to those of patients on pediatric intensive care units (PICUs). For example, separation from families, restricted visiting, exposure to painful medical procedures, observation of other ill patients, and reduced sensory stimulation are common to both PICUs and PBCUs. In PICUs, the emergence of nonmedical problems attributable to negative environmental conditions has been labeled the ICU syndrome (Maron, Bryan-Brown, & Shoemaker, 1973; Vernon, Foley, Sipowicz, & Schulman, 1965). In reviewing the literature on the ICU syndrome, Cataldo, Bessman, Parker, Pearson, and Rogers (1979) noted that few observational studies of the phenomenon exist.

Although PBCUs are similar in some aspects to PICUs, these environments also differ markedly in several respects. For example, most children in PICUs are admitted for acute problems (e.g., surgery) that do not require a protracted PICU stay and are confined to their beds at almost all times. In contrast, PBCU patients are typically hospitalized for longer periods and possess more options for environmental engagement because many are ambu-

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Table 1
Subject Characteristics for Sample of Pediatric Burn Victims

Variable	<i>M</i>	<i>SD</i>	Range
Age (in months)	51.70	50.90	5–190
Socioeconomic status	3.85	1.06	2–5
% burned surface area	9.50	7.37	1–30
% partial thickness	7.58	7.45	0–30
% full thickness	1.10	2.22	0–10
Number of body parts burned	4.15	2.56	1–12

latory. In addition, patients in PBCUs are typically exposed to intrusive medical procedures on a daily basis throughout the course of their hospitalization, whereas patients on PICUs may experience few procedures other than monitoring once acute treatment (e.g., surgery) has been conducted.

In their review, Tarnowski *et al.* (1987) pointed out the need for descriptive research with pediatric burn victims that assesses patients' responses to the PBCU environment. The emotional response of the burned child is commonly described anecdotally as involving anxiety, depression, aggression, regression with associated symptoms of exaggerated dependency, and inability to play (Kavanagh, 1983; Simons *et al.*, 1978; West & Shuck, 1978; Zide & Pardoe, 1976). Given the lack of empirical data supporting the anecdotal descriptions of children's responses to PBCUs and the inherent differences between these patient care units and PICUs, we evaluated patient and staff responses on a PBCU over a 6-month period. Patient behavioral demographics are presented and contrasted with the PICU data reported by Cataldo *et al.* (1979).

METHOD

Subjects

Subjects were 40 children (22 males, 18 females) who were admitted consecutively to a PBCU of a 320-bed children's hospital. Patient characteristics including age, socioeconomic status (5-point scale on which 5 represents highest and 1 lowest socio-

economic status [SES]) (Hollingshead, 1975), percentage of burned surface area (BSA), percentage of partial (second degree) and full (third degree) thickness burns, and number of body parts burned are presented in Table 1. As a group, children's burn injuries were found to be at the lower end of the range of major burn injuries (10% to 20% BSA) as defined by criteria advanced by the American College of Surgeons (1987). Children were predominantly white (72.5%) and from intact (55.0%) lower SES (65.0%) families. The mean duration of hospitalization was 18 days (range, 1 to 69). Injuries were the result of accidental (95%) or inflicted (5%) scalds (57.3%), flame burns (22.5%), hot objects (10.0%), electrical burns (7.5%), or other means (2.5%). Forty percent of the children had moderate disfigurement that was defined as visible scarring on hands, arms, face, or neck areas. The majority of children had sustained injuries on four or fewer body parts.

Setting and Staff

All observations were conducted on the 14-bed PBCU. The unit was staffed by an average of eight nurses during the day and evening shifts. All observations occurred during these two shifts. Physical, occupational, and respiratory therapists assigned to the unit were present during some of the observations as were child life and social workers. The unit contained a hallway that measured approximately 5 by 30 m. The nursing station was located at one end and patient rooms on both sides of the hallway. Patient rooms measured approximately 5 by 6.3 m and contained one bed each.

Dependent Measures

Demographic and illness history measure. Following each child's admission to the PBCU, informed consent was obtained and parents were asked to complete a demographic form that requested background information about the child (age, injury, family variables, etc.). The accuracy of these data were verified by review of medical records. One family refused participation in the study.

Behavioral observation measure. An observa-

tional coding scheme similar to that employed by Cataldo et al. (1979) was used. This coding system was derived from the Resident Activity MANIFEST (Cataldo & Risley, 1974) developed for use in institutional environments where there are limited data available on the exact nature of responses likely to occur in the setting.

The code used was modified to include an expanded number of observational categories under the verbalization/vocalization, affective state, and position categories (copies of the behavioral definitions are available from the first author). Unlike patients in the Cataldo et al. (1979) study, patients in the present study could be observed in locations other than in bed. In addition, some patients could ambulate independently. Coding categories were created that reflected the response capabilities of the patients on the PBCU. Molar patient response categories included waking state, location, bodily position, verbalization/vocalization, affective state, and activity. Care provider categories included verbalization, staff type (e.g., nurse, physical therapist), and number of individuals in proximity to patients.

To expedite data collection and processing, independent observers (two psychology graduate students) coded behavioral observations on optical scanning forms. Specifically, cardboard templates covered with acetate were constructed that labeled windows with all possible response codes such that a coder could simply make a pencil mark in the appropriate area of the scanning form. Optical scanning forms were paced on specially designed clipboards and the template fitted over the form. Optical scanning sheets were then read by an optical scanner and a tape file created for uploading to a mainframe computer for data analysis.

Analyses of the observational data were conducted as follows: percentages were calculated for each of the response categories in which the numerator reflected the number of subjects engaged in the behavior and the denominator consisted of the total number of subjects who could have emitted the response during a particular ward observation. For example, when calculating the per-

centage of observations during which positive verbalizations occurred, the analysis excluded those observations of patients observed to be asleep.

Interobserver reliability was assessed for approximately 20% of the observations. Reliability was assessed on a random schedule throughout the course of the study by two observers who independently recorded patient and staff responding. Percentage agreement was calculated for each response category by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Overall reliability collapsed across response categories was 94% (range, 88% to 98%). Reliabilities for specific categories were as follows: location 98%, waking state 98%, position 94%, verbalization/vocalization 91%, affective state 88%, individuals present 88%, and activity 90%.

Procedure

Patients were observed on the ward approximately every 2 hr between 8:00 a.m. and 6:00 p.m. each weekday. Patients were typically observed from a distance of 3 to 4 m. Observers were instructed to refrain from interaction with staff, parents, and children during observations. Reactivity was minimized because ward restrictions required observers to dress in the same attire as ward personnel (yellow surgical gown). The exact schedule of observations was determined by means of a computer-generated table that detailed five daily random observation times around a 2-hr average. The schedule specified the exact hour and minute that each observational sweep of the ward was to be conducted. The randomized schedule permitted a representative sample of observations of the ecology of the unit (e.g., all patient mealtimes sampled).

The manner in which observations were conducted was similar to that described by Cataldo et al. (1979). Observers coded, for 1 min, the behavior of each patient and individuals interacting with the patient. The observation period was continuous. Responses were recorded at the end of the interval. Patients were occasionally unavailable for ward observations (e.g., because of surgery, spe-

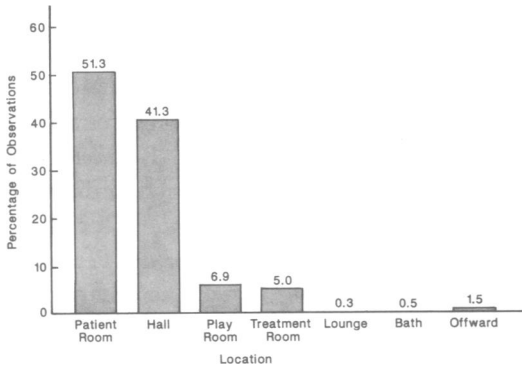


Figure 1. Percentage of observations for patient location.

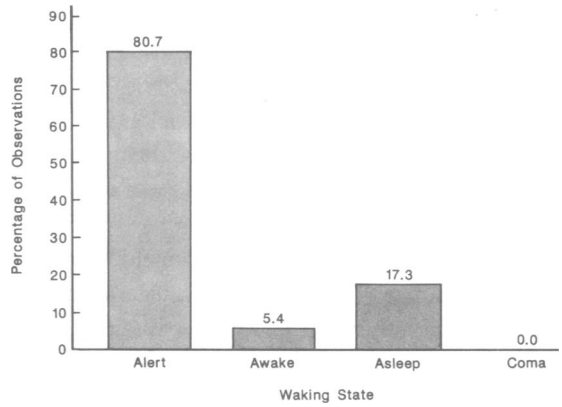


Figure 2. Percentage of observations for patient waking state.

cialized tests, or being in parents' lounge with door closed, in bathroom, or ward private treatment room).

RESULTS

Observational Data

A total of 1,919 patient observations were scheduled of which patients were unavailable for direct observation 7.3% of the time. Data are expressed as percentages. Subjects' locations, waking states, positions, and the presence of other individuals are displayed in Figure 1. The locations of patients unavailable for observations were: treatment room (68.6%), off ward (20.7%), bathroom (7.1%), and parents' lounge (3.6%). The data indicate that the children were in their rooms for most observations (51.3%) but were often observed out of bed and in the ward hallway (41.3%) and playroom (6.9%) as well. Cumulative percentages across all locations exceed 100 because some ambulatory children were observed in multiple locations during the 1-min observation interval.

Figure 2 shows the waking status of the children. The largest proportion of children were observed to be alert (80.7%). In addition, a small percentage was judged to be awake (5.4%). Less than one fifth of the subjects were found to be asleep (17.3%) and none were in a comatose state.

The physical positions of the children are displayed in Figure 3. Most children were found to be either lying (47.5%) or sitting (40.5%). How-

ever, a moderately large proportion of subjects were observed to be standing (14.3%). Less than one tenth of the children were being held by parents or staff (8.3%) and very few children were observed in restraint (0.4%). Most children (89.8%) maintained one position during observation.

The type of individuals potentially available to interact with children during observations is shown in Figure 4. Other patients (35.6%) and nurses (35.1%) were most often available, followed by family members (27.8%), miscellaneous staff or visitors (defined as other in Figure 4) (23.5%), psychosocial staff (11.1%), child life workers (6.5%), and medical staff (4.4%). Cumulative percentages exceed 100 because several individuals could be present during an observation. Children were observed to be alone for 24.0% of the observations. A single individual was present for 22.0%

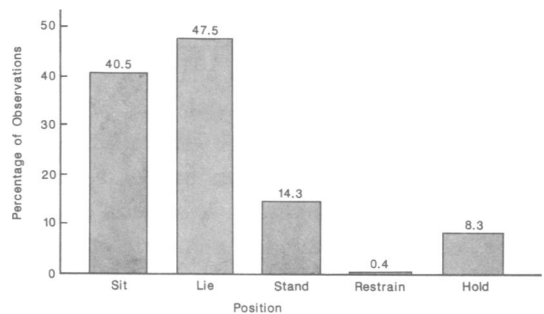


Figure 3. Percentage of observations for patient physical position.

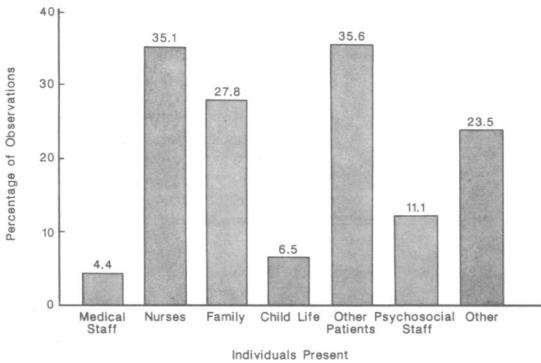


Figure 4. Percentage of observations for presence of other individuals.

of the observations, 2 persons for 21.6%, 3 persons for 13.1%, and 4 or more for 19.3%.

Figure 5 displays the data for verbalizations and vocalizations from and to awake and alert children. Children were observed to verbalize or vocalize during approximately two thirds of the observations (33.6% verbalization, 35.8% vocalization). Verbalizations to children occurred most of the time (61.4%) that such interactions were possible (people present and child awake or alert). Verbalizations about the child were relatively infrequent (16.6%).

Subcategories of children's verbalizations and affective state are presented in Figures 6 and 7. Children displayed positive responding during one fourth of the observations (23.5%). Distressed (negative) verbalizations were infrequent (2.1%). Distressed vocalization and distressed motoric responses were observed with approximately the same frequency

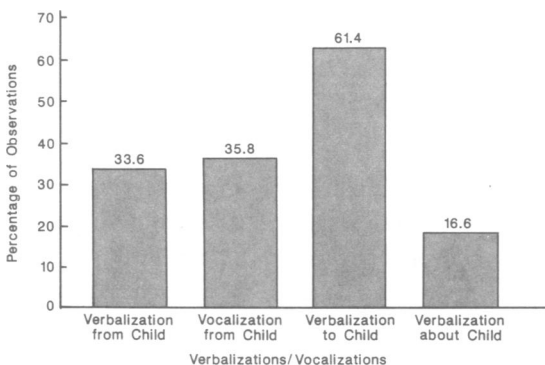


Figure 5. Percentage of observations for child verbalizations or vocalizations and adult verbalizations.

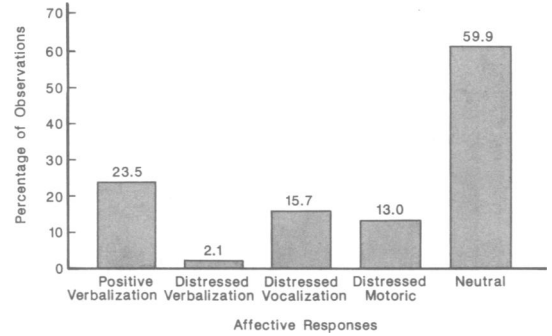


Figure 6. Percentage of observations for patient molecular affective responses.

(15.7% and 13.0%, respectively). Most often, children exhibited neutral affect (59.9%). Children's nonneutral affective categories were combined into four molar levels (very poor = no positive and two distress responses; poor = no positive and one of three distress responses [distressed vocalization, verbalization, and motoric responses]; fair = some combination of positive and negative responses; and good = positive response only). Results indicated that children displayed good, fair, poor, and very poor affect for 60.6%, 0.2%, 11.4%, and 27.8% of the observations, respectively.

The engagement of awake and alert children with the PBCU environment was indexed further by calculating the percentage of observations during which children were involved in seven specific activities (multiple activities possible): play (29.7%), eating (17.8%), ambulation (13.0%), locomotion

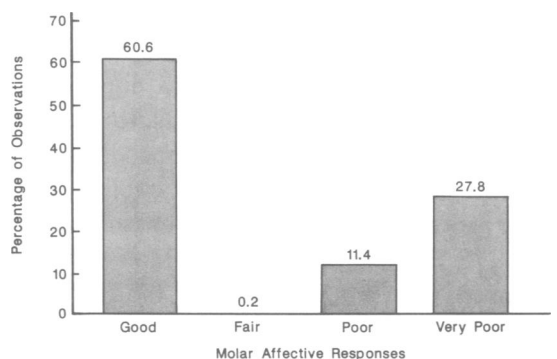


Figure 7. Percentage of observations for patient collapsed molar affective responses.

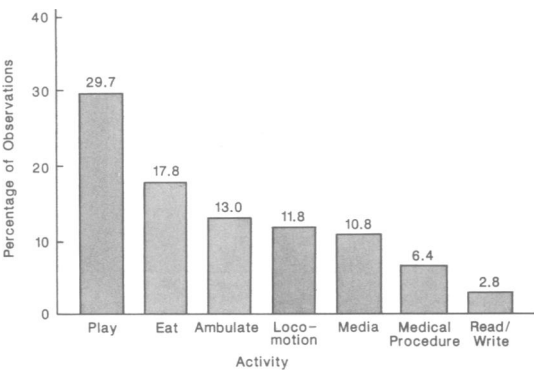


Figure 8. Percentage of observations for patient activity engagement.

(11.8%), media activity (10.8%), medical procedures (6.4%), and reading or writing (2.8%). Non-engagement was noted during 46.9% of the observations. For children engaged in activities, 25.7% were observed to be involved in multiple activities. These data are depicted in Figure 8.

Additional analyses of children’s affect were conducted to determine how affect varied as a function of the ward setting and type of individual present. The molar affective response data for the patient room, hall, and ward playroom settings are presented in Table 2. Children’s affective responses were judged to be good in less than one half (44.4%) of the observations that took place in patient rooms. These data contrast markedly with that observed in the hall (72.2%) and playroom (82.8%) settings. Very poor affective responding was observed infrequently in the playroom (12.9%), but was more common in the hall (21.4%) and patient rooms (37.4%).

Molar affective response data as a function of type of individual present are also displayed in Table 2. Data indicate that the children demonstrated the most positive affective responding in the presence of child life staff (84.2%), followed by other patients (79.1%), miscellaneous staff and visitors (78.5%), psychosocial staff (71.2%), family members (56.9%), medical staff (53.3%), and nurses (52.0%).

Analyses of children’s molecular affective states as a function of engagement in specific activities revealed that neutral affect was most often displayed

Table 2
Percentage of Molar Affective Responses by Patient Location and Type of Individual Present

	Molar affective responses			
	Good	Fair	Poor	Very poor
Location				
Playroom	82.8	0	4.3	12.9
Hall	72.2	0	6.4	21.4
Patient room	44.4	0.4	17.8	37.4
Individual Present				
Child life	84.2	0	3.5	12.3
Other patients	79.1	0	4.8	16.1
Others	78.5	0	5.8	15.7
Psychosocial staff	71.2	0	6.1	22.7
Family	56.9	0	10.4	32.7
Medical staff	53.3	0	6.7	40.0
Nurses	52.0	0.4	11.8	35.8

while children were involved in media activities (83.6%), followed by reading or writing (80.5%), eating (55.9%), playing (47.6%), ambulating (44.2%), locomoting (36.6%), and during medical procedures (19.5%). Positive affective responses were most often noted during play (40.9%), followed by ambulation (39.6%), locomotion (36.1%), eating (22.6%), reading or writing (12.2%), media activities (9.1%), and medical procedures (4.6%). Collapsing across negative affective responses revealed that negative affect was most often exhibited during medical procedures (75.9%), followed by locomotion (27.3%), eating (21.5%), ambulation (16.2%), play (11.5%), media (7.3%), and reading or writing (7.3%).

Relationship of Behavioral Distress to Subject and Environmental Conditions

Four Pearson product moment correlation coefficients were calculated to examine the relationship between children’s age and subtype of behavioral distress. Probability values for the Pearson correlations were based on the *t*-distribution. Significant correlations emerged for distressed vocalization (*r* = −0.38, *p* < .02), distressed motoric (*r* = −0.34, *p* < .03), and distressed verbalization (*r* = 0.34, *p* < .03). Total burned BSA was not

significantly related to any of the distress subcategories.

Environmental engagement (defined as engagement in one or more of the activity responses) was found to be significantly related to positive affective responding ($r = 0.31, p < .025$). No statistically significant relationship emerged between engagement and distress responses.

The presence of individuals was found to be associated with child positive affective responding ($r = 0.30, p < .05$). Further specification of this relationship revealed that the presence of other pediatric burn patients was significantly associated with child positive responding ($r = 0.28, p < .05$). However, the presence of family members, nursing, medical, psychosocial, and child life staff was not significantly related to positive affect.

DISCUSSION

Observations were taken on 40 of the 41 children admitted to a pediatric burn unit over a 6-month period. Data indicated that children were awake, active, often out of their rooms, and interacting with other patients, staff and parents. Neutral affect was mostly commonly observed. However, when nonneutral states were noted, they consisted largely of good or fair affect. Positive affect was related to environmental engagement, ward location, and presence of others. These findings are incongruent with the commonly reported descriptions of burned children (e.g., Kavanagh, 1983). Consistent with previous reports (Katz, Kellerman, & Siegel, 1980; Tarnowski & Kaufman, 1988), older children tended to demonstrate distress more through verbalization and less through vocalization and motoric responding. Interestingly, total BSA was not related to amount or type of behavioral distress. Given that total BSA reflects the seriousness of burn injury, greater distress was expected for the most seriously injured children. The obtained results could be due, in part, to the lack of treatment-room observations and a limited range of BSA in the sample (range, 1% to 30%; $M = 9.5\%$).

Using a similar methodology to study behavior

on a PICU, Cataldo et al. (1979) reported that the children demonstrated limited interaction with their environment, showed primarily neutral or negative affect, and spent most of their time lying in bed, nonengaged, and nonattentive. Although direct comparison of the present findings with the findings of Cataldo et al. is difficult because of interstudy differences in behavioral definitions and data analyses, general comparisons reveal both similarities and differences between PICU and PBCU environments. Children on the PICU were awake or alert in 46% of the observations. In comparison, PBCU children were awake or alert in 85.5% of the observations. Verbalizations to the children were noted in 55% of the observations on the PICU compared to 61.7% of the observations on the PBCU. On the PICU, 82% of the observations revealed no verbalizations from the children, whereas on the PBCU this was recorded for 66.4% of the observations. Nonengagement was noted 54% of the time on the PICU and 49.6% of the time on the PBCU. In the present sample, subjects demonstrated positive affect during 23.5% of the observations compared to only 3% of the observations on the PICU. Neutral affect was recorded for 60% of the observations made on the PBCU and 58% of those made on the PICU. Cataldo et al. (1979) reported negative affect occurring in 33% of the PICU observations. In the present case, negative affect was defined as the occurrence of one or more of the behavioral categories of distressed verbalizations, vocalizations, or motor response. Using this definition, negative affect occurred in only 16.0% of the total observations made of awake or alert children.

Cataldo et al. (1979) suggested that the pattern of neutral affect, nonengagement, and nonattentive responding observed in the PICU is consistent with animal research on conditioned suppression and learned helplessness. However, the comparability to highly controlled animal research on conditioned emotional responses and learned helplessness is questionable (Rescorla, 1968; Seligman, 1975). The behavioral definition of conditioned suppression or helplessness as neutral affect or lack of engagement may not reflect a state of helplessness

as described by Seligman (1975). A child may display neutral affect for multiple reasons: emotional "giving-up," boredom, or concentration. For example, children were observed to display neutral affect in 84% of the observations during which they were watching television but in only 48% of observations during play.

Our global evaluation of the atmosphere in the PBCU was that no generalized syndrome of suppression or helplessness existed. Our PBCU subjects showed nonengagement in 46.9% of the intervals, but demonstrated considerably more positive (23.5% vs. 3%) and less negative (16.0% vs. 33%) affect and a reversed ratio of positive to negative affect compared to children on the PICU. The concept of learned helplessness (Seligman, 1975) may be applicable to the behavior of children in intensive care units, as Cataldo *et al.* (1979) have pointed out. The lack of predictability and control over aversive events in a PICU, at least from the child's point of view, may be an environmental constant. However, the lack of critical baseline data on the levels of engagement and affecting responding by children in hospital and non-hospital environments makes it difficult to determine whether the behavioral syndrome of suppression or helplessness is actually reflected by either our or Cataldo *et al.*'s data.

The PBCU environment we studied had many characteristics that mitigated the development of suppression or helplessness. Aversive medical treatments were conducted by a limited number of individuals who provided differential cues as to their occurrence (e.g., by medical personnel, in morning and evening only, and never while parents were on the ward) and treatments were invariably performed in a specific treatment room. In addition, it may have been possible for some patients to momentarily postpone or otherwise behaviorally alter the conditions of treatment administration (e.g., delay procedures by request or participate in the treatment process). These elements of prediction and control have, in fact, been shown to reduce treatment-related distress in pediatric burn patients (Kavanagh, 1983; Seligman, 1975; Shorkey & Taylor, 1973; Tarnowski *et al.*, 1987).

Use of the present ecobehavioral descriptive anal-

ysis suggests that positive affect and engagement are more frequent when children are with individuals (e.g., child life workers) or in locations (e.g., playroom) that have not been associated with aversive medical procedures. Direct experimental manipulations, as opposed to existing descriptive information, are needed to validate the relationship between predictability and degree of control and the absence of the ICU syndrome.

The generality of the findings of the present study are limited, because only one PBCU was examined. PBCUs vary in patient populations (e.g., children only, adults and children), staffing ratios, visiting restrictions (e.g., allowing only parents), treatment philosophy (e.g., use of medications, surgical debridement), physical environments, and availability of child life workers and psychosocial support persons. Additionally, the present sample was comprised predominantly of younger children and may have been biased toward children with less severe burns. Thus, the assessment of other PBCUs is needed.

The behavioral observation methodology used in the present study and in the Cataldo *et al.* (1979) study yields useful descriptive and ecobehavioral data. This research represents an extension of ecobehavioral assessment methodologies that have been used to document the impact of setting events and specific environmental factors on the behavior of mentally retarded individuals in a variety of settings (Felce, deKock, & Repp, 1986; Schroeder *et al.*, 1982). Similarly, this observational methodology can be used to assess interactions that may impact the care and adjustment of children in medical settings. In addition, the current methodology should be used to assess other pediatric units, especially those that are not specialized or designed for intensive care patients, to determine how variables such as ward procedures, shift changes, time of day, and so on, influence specific patient responses. Follow-up studies relating behavioral observation data to posthospitalization adjustment are also needed. Unfortunately, little data exist concerning children's long-term behavioral adjustment following serious burn injury (Tarnowski, Rasnake, Linscheid, & Mulick, *in press*).

The observational system developed by Cataldo

et al. (1979) and modified for use in this study has proven flexible and reliable. Its utility for descriptive behavioral and ecobehavioral assessment that may lead to better understanding of the interaction of disease, treatment, environment, and behavior is apparent.

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